

CLAIMS

1. A method for testing the functioning of downlink data communication in a mobile station equipped for receiving a signal in the downlink direction and for sending a signal in the uplink direction, comprising the steps of:

- 5 - receiving a test signal in the downlink direction,
 - comparing the received test signal to a known form of the test signal,
 - producing and temporarily storing information about errors which were detected in the received test signal during the comparing step, and
 10 - sending in the uplink direction a signal representing the stored information about errors.

2. A method according to claim 1, comprising the step of generating a pseudorandom bit sequence at the mobile station in order to produce the known form of the test signal.

- 15 3. A method according to claim 1, wherein the step of producing and temporarily storing information about errors detected in the received test signal during the comparing step comprises the step of producing and temporarily storing information about the detected bit error ratio of the received signal, and the step of sending in the uplink direction a signal representing the stored information about errors comprises the step of sending in the uplink direction a signal representing the
 20 detected bit error ratio.

4. A method according to claim 1, wherein the step of producing and temporarily storing information about errors detected in the received test signal during the comparing step comprises the step of producing and temporarily storing information about the frame erasure ratio of the received signal, and the step of sending in the
 25 uplink direction a signal representing the stored information about errors comprises the step of sending in the uplink direction a signal representing the detected frame erasure ratio.

5. A method according to claim 1, comprising the steps of:

- 30 - receiving a command of a certain first protocol level in the downlink direction, and
 - in response to the received command, setting the mobile station into a test mode where no notification about an established bi-directional communication link is sent to protocol levels higher than said first protocol level.

6. A method according to claim 5, wherein said first protocol level is a Layer 3 RR level.

7. A method according to claim 1 wherein, in a mobile station equipped for converting a downlink signal to baseband and for demodulating, decrypting and channel decoding the signal converted to baseband, the step of comparing the received test signal to a known form of the test signal is performed after demodulation and decryption but prior to channel decoding.

8. A method according to claim 1 wherein, in a mobile station equipped for converting a downlink signal to baseband and for demodulating, decrypting and channel decoding the signal converted to baseband, the step of comparing the received test signal to a known form of the test signal is performed after demodulation, decryption and channel decoding.

9. A method for testing the functioning of data communication in a communication connection between a device equipped for sending a signal in the downlink direction and for receiving a signal in the uplink direction and a mobile station equipped for receiving a signal in the downlink direction and for sending a signal in the uplink direction, comprising the steps of:

- generating a first test sequence,
- generating errors in a known way in the first test sequence to produce a second test sequence,
- sending the second test sequence in the downlink direction to the mobile station,
- producing at the mobile station a third test sequence corresponding to the first test sequence,
- comparing at the mobile station the second test sequence to the third test sequence in order to detect differences between the second and third test sequences, and
- sending in the uplink direction from the mobile station information representing the differences detected between the second and third test sequences.

10. A method according to claim 9, wherein the step of sending the second test sequence in the downlink direction to the mobile station comprises the step of sending the second test sequence from a test equipment to a mobile station under testing, and the step of sending in the uplink direction from the mobile station information representing the differences detected between the second and third test sequences comprises the step of sending said information from said mobile station under testing to said test equipment.

11. A method according to claim 9, wherein the step of sending the second test sequence in the downlink direction to the mobile station comprises the step of sending the second test sequence from a base station of a cellular radio system to a mobile station operating within the cellular radio system, and the step of sending in the uplink direction from the mobile station information representing the differences detected between the second and third test sequences comprises the step of sending said information from said mobile station operating within the cellular radio system to a base station of said cellular radio system.

12. A method for testing the functioning of downlink data communication in a cellular radio system, comprising the steps of:

- sending a test signal from a base station to at least one mobile station,
- receiving the test signal sent by the base station at a mobile station,
- comparing the test signal received at the mobile station to a known form of the test signal,
- producing and temporarily storing at the mobile station information about errors which were detected in the received test signal during the comparing step,
- sending information representing the stored information about errors from the mobile station to a base station,
- receiving the information sent by the mobile station at a base station, and
- storing in the cellular radio system the information received by the base station.

13. A method according to claim 12, comprising the steps of:

- sending a test signal from a large number of base stations to a large number of mobile stations,
- receiving information sent by a large number of mobile stations at a large number of base stations,
- storing the information received by the base stations at a control station of the cellular radio system, and
- producing, at the control station, information representing the quality of downlink data communication in the cellular radio system.

14. A method according to claim 12, wherein for measuring the general quality of data transmission in a cellular radio system comprising base stations and mobile stations it comprises the steps of

- a) generating a test signal which is transmitted, via a base station of the cellular radio system, to a mobile station of said cellular radio system,

b) generating and storing at the mobile station information describing the occurrence of errors in the test signal received by the mobile station,

c) transmitting from the mobile station to the base station a first error message describing the occurrence of errors within a given block of data of the test signal received by the mobile station, and

d) transmitting from the base station to a certain control unit a second error message describing the first error message received from the mobile station of the cellular radio system.

15. A method according to claim 14, wherein at step a), there is generated a test signal which also is a pilot signal transmitted by the base station.

16. A method according to claim 14, wherein at step a), there is generated a test signal which also is a synchronization sequence in a downlink burst transmitted by the base station.

17. A method according to claim 14, wherein at step a), there is generated a pseudorandom bit sequence.

18. A method according to claim 17, comprising the steps of:

- generating at the mobile station the same pseudorandom bit sequence that was generated at step a) and

- comparing at the mobile station the self-generated pseudorandom bit sequence with the received test signal.

19. A method according to claim 14, wherein at step c), from the mobile station there also is transmitted to the base station a first location message describing the location of the mobile station.

20. A method according to claim 19, wherein at step c), there is transmitted from the mobile station to the base station a location update message.

21. A method according to claim 14, wherein at step c), from the mobile station there is transmitted to the base station the value of the average bit error ratio or frame erasure ratio within a given block of data as detected by the mobile station.

22. A method according to claim 14, wherein at step d), the data received from the mobile station is transmitted as such to the control unit.

23. A method according to claim 14, wherein at step d), a parameter describing the location of the mobile station is also transmitted to the control unit.

24. A mobile station of a cellular radio system, comprising:

- reception means for receiving a signal in the downlink direction,
- 5 - transmission means for sending a signal in the uplink direction,
- comparison means for comparing a received test signal to a known form of the test signal,
- means for producing and temporarily storing information about errors which were detected in the received test signal by said comparison means and
- 10 - uplink sending means for sending in the uplink direction a signal representing the stored information about errors.

25. A mobile station according to claim 24, comprising:

- downconversion means for converting received downlink data to baseband,
- a demodulator for demodulating the data converted to baseband,
- 15 - decrypting means for decrypting the demodulated data,
- a channel decoder for channel decoding the demodulated and decrypted data
- a channel encoder for channel encoding uplink data,
- encrypting means for encrypting the channel encoded uplink data,
- a modulator for modulating the encrypted channel encoded uplink data onto base-
- 20 band oscillations, and
- upconversion means for converting the modulated baseband oscillations onto a transmission frequency for transmitting,
- wherein said comparison means, said means for producing and temporarily storing information about errors and said uplink sending means are arranged to establish a
- 25 coupling from the output of the decrypting means to the input of the encrypting means.

26. A mobile station according to claim 25, comprising:

- downconversion means for converting received downlink data to baseband,
- a demodulator for demodulating the data converted to baseband,
- 30 - decrypting means for decrypting the demodulated data,
- a channel decoder for channel decoding the demodulated and decrypted data
- a channel encoder for channel encoding uplink data,
- encrypting means for encrypting the channel encoded uplink data,
- a modulator for modulating the encrypted channel encoded uplink data onto base-

band oscillations, and

- upconversion means for converting the modulated baseband oscillations onto a transmission frequency for transmitting,

5 wherein said comparison means, said means for producing and temporarily storing information about errors and said uplink sending means are arranged to establish a coupling from the output of the channel decoder to the input of the channel encoder.

27. A system for measuring the general quality of data transmission in a cellular radio system, said system comprising a base station subsystem and a mobile station, comprising:

10 - in the base station subsystem, means for generating a test signal and for transmitting it via a base station of the cellular radio system to the mobile station of the cellular radio system,

- in the mobile station, means for generating and storing data describing the occurrence of errors in the test signal received by the mobile station,

15 - in the mobile station means for transmitting a first error message to the base station subsystem, said first error message describing the occurrence of errors in a certain block of data in the test signal received by the mobile station, and

20 - a control unit for collecting such error data that describes the error messages received by the base station subsystem of the cellular radio system from the mobile stations.

28. A system according to claim 27, comprising in the base station subsystem and in the mobile station means for generating the same pseudorandom bit sequence, and in the mobile station means for comparing the pseudorandom bit sequence generated by the mobile station with the pseudorandom bit sequence received from
25 the base station subsystem.

29. A system according to claim 27, comprising in the mobile station means for generating data describing the location of the mobile station and for transmitting said data to the base station subsystem together with the first error message.

30 30. A system according to claim 27, characterised in that it comprises in the base station subsystem means for generating data describing a location and for transmitting said data to the control unit.